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DWIGHT S. SHEETER
Mechanical Engineering Technician
Autovon 787-4234
Commercial (513)257-4234

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Comparative Evaluation of Container Leak Test
Procedures of Federal Test Method Standard 101B
Method 5009

HQ AFALD/PTP
Air Force Packaging Evaluation Agency
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ABSTRACT

This report presents an evaluation of Container Leak tests, i.e., the squeeze technique, (para 6.4), versus the vacuum chamber technique, (para 6.2), prescribed in method 5009-1 of Federal Test Method Standard 101-B. The squeeze test was found to be a suitable alternative to the vacuum chamber test for determining leaks in flexible self supporting containers sealed in atmospheric conditions.

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PREPARED BY: *Dwight S. Sheeter*
 DWIGHT S. SHEETER
 Mechanical Engineering Technician
 AF Packaging Evaluation Agency

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REVIEWED BY: *Matthew A. Venetos*
 MATTHEW A. VENETOS
 Chief, Materials Engineering Div.
 AF Packaging Evaluation Agency

APPROVED BY: *Jack E. Thompson*
 JACK E. THOMPSON
 Director
 AF Packaging Evaluation Agency

1. Objective

The purpose of this investigation was to evaluate Federal Test Method Standard 101B, Method 5009 squeeze test to determine if it is an acceptable alternative to the vacuum chamber test now required by the Air Force in contracts with Champion Spark Plug Company of Toledo Ohio.

2. Background

Champion Spark Plug Company requested San Antonio ALC to grant a waiver of the requirement for the Vacuum Chamber leak test in favor of the squeeze test for self supporting polyethylene tubes utilized for packing products delivered under contract with the Air Force.

Approval of the waiver would provide Champion Spark Plug with a less time consuming method of test and would also reduce the monetary expenditures for equipment required to accomplish the leak test

Sample containers were requested from the Champion Spark Plug Company. Six containers were provided; 2 samples with only one end sealed as received from the container supplier; 2 samples with both ends sealed; and 2 samples with jet engine ignitors enclosed and both ends sealed.

3. Package Construction

The containers were examined and found to be fabricated from a flexible 1 inch diameter polyethylene extrusion .026 inches thick and 5 1/2 inches long with one end sealed by the container supplier and the second end sealed after product insertion by the contractor, Champion Spark Plug Company.

4. Test Procedures/Results

a. Vacuum Test - A vacuum chamber test of one tube was performed in accordance with Federal Test Method Standard 101B, Test Method 5009, paragraph 6.2. The sample was submerged under one inch of water and placed in the high altitude chamber manufactured by the Atlas Engineering Co. of West Hartford Conn Model U16-90V. The chamber was evacuated to 9.72 inches of mercury. This provided a pressure differential between the air inside the tube and the air outside the tube of approximately 4.75 lbs per square inch. At this point the seal made by Champion Spark Plug failed. Escaping air caused a stream of bubbles to form in the water where the leak occurred.

b. Squeeze Test - A one inch diameter metal plug with a 1/4 inch tube passing through the center and protruding 1 1/2 inch was affixed with solder. Electrical tape was wrapped around the plug to provide a snug fit with the Champion container. This assembly was placed approximately one half inch into the container and sealed with a hose clamp. The 1/4 inch tube was connected to a pressure gauge, (Heise H 32581), with a plastic tube approximately four inches long. All connections were clamped to prevent leaks. Three sample containers were evaluated. Sample #1 consisted of an empty container sealed at both ends. The end sealed by the container supplier was cut off and the prepared plug was inserted, sealed, and connected to the pressure gauge.

This tube was squeezed repeatedly. The pressure gauge showed a maximum of 5 pounds per square inch pressure with the average estimated at 4.5 pounds per square inch. This test was terminated after five squeezes at which time the tube end sealed by the Champion Spark Plug Co. failed.

Sample #2 consisted of a tube sealed at both ends, with ignitor inside. The end sealed by the Champion Spark Plug Co. was cut off and the prepared plug was inserted approximately one half inch and sealed with a hose clamp with the contents remaining with the tube. This assembly was connected to the pressure gauge and all connections were clamped. Repeated squeezes caused the gauge to show a high of 3.75 pounds per square inch with the average estimated at three pounds per square inch. No seal failure occurred.

The third tube, with an ignitor, inside and each end sealed was pierced with a .0141 inch diameter wire. This tube was immersed in water and squeezed very slightly. The result was a stream of very small but highly noticeable bubbles forming at the puncture and rising to the surface of the water indicating a defective container.

5. Conclusion

Based on the results described above, it is concluded that the squeeze test is as effective as the vacuum chamber test for the identification of leaks in flexible packages of the type evaluated in this study.

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